Managing Algae and Cyanobacteria in California Rice Fields

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Mat-forming green algae (e.g., *Hydrodictyon*) and cyanobacteria (e.g., *Nostoc spongiaeforme*) are problematic for rice growers. Their abundant growth may affect rice yields by increasing mortality of rice seedlings. For example *Nostoc* mats may dislodge seedlings when they float upward from the soil surface where they initially form or the mats may smother seedlings when they accumulate due to wind action and then settle back to the soil surface. These problems have been typically addressed by the application of 1 part per million or less copper sulfate. However, recently this approach has not been as successful as in the past.

This may in part be explained by rice field conditions immediately following field flooding in spring. Specifically, rice straw from the previous growing season may affect the efficacy of subsequent copper sulfate treatments for algae control. We measured the copper binding capacity of rice straw and found that from 0.8 to 1.2 ppm of copper can be bound by the straw present in four of six fields examined. This is a significant portion of the 1 ppm copper that may be applied for algae control. These results suggest that straw management may be integral to reducing algal problems in the following growing season.

We have also evaluated several commercially available algicides for ability to reduce growth of *Nostoc spongiaeforme*. To date we have not found an algicide that can give the results that growers would anticipate.

Another approach to managing excessive algal growth is to alter environmental conditions that support this growth. One strategy involves reducing the amount of what is often the limiting nutrient for algae in freshwater systems, inorganic phosphorus (phosphate). Results from field studies comparing two phosphorus fertilizer application methods (P fertilizer applied 19 to 30 days after flooding, or surface applied liquid phosphate fertilizer followed by a roller prior to flooding) indicate that phosphate water concentrations were lower in fields where P fertilizer application was delayed. In most cases, algal abundance was also lowest for fields which received the delayed P fertilizer treatment. These fields had less “algae” than fields which received the conventional phosphate application, i.e., surface application of a liquid phosphate fertilizer followed by a roller. The results of these measurements clearly show that phosphate water concentrations and algal abundance were reduced by the delayed P fertilizer application. Delaying P fertilizer application until rice seedlings have emerged from the water may be an alternative “algae” management method for some growers.